

Wild Juvenile Salmonid Monitoring Program Quatsino Sound, BC 2018

Prepared for

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Summary

Beach seine sampling was conducted on behalf of Marine Harvest Canada in Quatsino Sound, BC in 2018. Sampling was completed to monitor sea lice abundance, prevalence and intensity on juvenile wild salmon within Quatsino Sound in support of the Aquaculture Stewardship Certification process for Marine Harvest Canada finfish aquaculture sites in the area.

This data report represents the fourth year of wild juvenile salmonid monitoring within Quatsino Sounds and Holberg Inlet.

Sampling was conducted during two separate sampling events in April and May 2018, selected to coincide with the peak outmigration period of juvenile salmonids. Sampling was completed at 10 sites within Quatsino Sound and Holberg Inlet, BC. The sites were selected based on their locations relative to existing aquaculture sites located in the area. Sampling was completed with the support of the G̓usgimukw people of the Quatsino First Nation.

Thirty individuals from each target fish species (Pacific salmonids and threespine stickleback) or the total number of captured individuals from each target species (if less than 30 were captured) were collected from each of the 10 sites during the sampling events. Total catch numbers of each species were recorded. Water quality measurements including surface temperature and salinity were recorded at each site during each sampling event.

Collected sample fish were frozen and delivered to the Center for Aquatic Health Sciences (CAHS) for laboratory analysis. Sea lice infestation data was tabulated by CAHS and provided to Mainstream Biological Consulting for reporting. Sea lice observed on the individual fish specimens during laboratory analysis were identified as either *Lepeophtheirus spp.* or *Caligus sp.* These lice are assumed to be *L. salmonis* and *C. clemensi* due to the lack of documented infestation of Pacific salmon by other species. The lice were recorded by life stage and the sex of pre-adult or adult motile lice was determined.

This data summary report documents the observed sea lice infestation rate on retained wild juvenile salmon collected in Quatsino Sound and Holberg Inlet in 2018. A total of 399 wild juvenile salmonids underwent lab analysis for sea lice infestation including 325 chum salmon, 37 coho salmon, 31 sockeye salmon and six chinook salmon. No Atlantic salmon (*Salmo salar*) were captured during sampling completed in Quatsino Sound and Holberg Inlet in 2018. From the total sample population 33 samples were infested with 74 sea lice. The calculated prevalence for the total sample population was 8.3 % and the sea lice abundance was 0.19 for the sample population collected in Quatsino Sound and Holberg Inlet in 2018.

Chum salmon smolts were captured in significantly greater numbers than any other species. A total of 6684 chum salmon were captured, representing 98.6 % of all captured salmonids. Of the 6684 chum captured, 325 were kept for lab analysis for sea lice infestation. A total of 18 chum smolts were found to be infested with a total of 18 lice resulting in a calculated prevalence of 5.5 %, abundance of 0.06 and an average intensity of 1.0 for the chum salmon sample population.

A total of 40 coho salmon were captured, representing 0.6 % of all captured samples. Of the 40 coho captured, 37 were kept for lab analysis for sea lice infestation. A total of 13 coho smolts were found to be infested with a total of 54 lice resulting in a calculated prevalence of 35.1 %, abundance of 1.46 and an average intensity of 4.2 for the coho salmon sample population. Two coho were infested with one louse, two were infested with two lice, four coho were infested with three lice, two were infested with four lice, one coho was infested with five lice, one with nine lice and one coho salmon was infested with 14 lice.

A total of 51 sockeye salmon were captured, representing 0.8 % of all captured samples. Of the 51 sockeye captured, 31 were kept for lab analysis for sea lice infestation. Two sea lice were found on two sockeye salmon smolts resulting in a calculated prevalence of 6.5 %, abundance of 0.06 and an average intensity of 1.0 for the sockeye salmon sample population.

A total of ten *Lepeophtheirus salmonis* sea lice of various life stages were identified on ten juvenile salmon and 64 *Caligus clemensi* sea lice were found on 23 of the

samples analyzed in the lab. There were no juvenile salmon that were infested with both a *L. salmonis* and a *C. clemensi* sea louse.

For the chum salmon sample population, a total of ten *L. salmonis* sea lice of various life stages were identified on ten juvenile chum salmon and eight *C. clemensi* sea lice were found on eight of the juvenile chum salmon analyzed in the lab. None of the chum salmon analyzed in the lab were infested with multiple lice or lice from both species.

For the coho salmon sample population, 54 sea lice were identified on 13 juvenile coho salmon. All of the sea lice identified were *C. clemensi*, no *L. salmonis* sea lice were identified on any of the juvenile coho salmon analyzed in the lab. All of the coho salmon samples were collected in May 2018 and of the 54 sea lice identified on the samples, 53 of the lice were found on 12 samples collected at Site 3.

Two sea lice were found on two of the sockeye salmon sample population. Both of the lice were identified as *C. clemensi*.

A comparison of the prevalence, abundance and average intensity of sea lice species found on chum salmon was completed for sample data between 2015 and 2018 collected in Quatsino Sound and Holberg Inlet. This data is presented in the following summary table with additional yearly comparisons of juvenile wild salmon monitoring results presented in Appendix IV.

Year	<i>Caligus clemensi</i>			<i>Lepeophtheirus salmonis</i>		
	Prevalence	Abundance	Average Intensity	Prevalence	Abundance	Average Intensity
2015	13.6 %	0.24	1.75	12.4 %	0.21	1.72
2016	8.6 %	0.11	1.32	8.9 %	0.10	1.09
2017	1.7 %	0.02	1.00	1.7 %	0.02	1.00
2018	2.5 %	0.02	1.00	3.1 %	0.03	1.00

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1.0 Introduction

At the request of Marine Harvest Canada, beach seine sampling to capture wild juvenile salmon to be analyzed for sea lice infestation took place at 10 sites located in Quatsino Sound and Holberg Inlet, BC (Figure 1). The sample collection occurred during two sample events in 2018 on April 3 and May 1. These weeks were selected to coincide with the estimated peak outmigration dates of juvenile salmonids. Sampling was completed with the support of the G̓usgimukw people of the Quatsino First Nation.

Parasitic copepods from the family Caligidae (sea lice) found in the coastal waters of British Columbia are divided into two genera: *Lepeophtheirus* and *Caligus*. Eleven species of *Lepeophtheirus* have been identified infesting fish in the Pacific Ocean, while only one species of *Caligus* (*Caligus clemensi*) have been identified (Margolis and Arthur 1979; McDonald and Margolis, 1995). *Caligus clemensi* infest a wide range of natural hosts in the marine environment including salmonids and non-salmonids; while *L. salmonis* natural hosts on the Pacific coast have been found to include Pacific salmon, threespine stickleback and Pacific herring. *Lepeophtheirus* spp. sea lice found on salmonid specimens were assumed to be *L. salmonis* due to the lack of documented infestations of Pacific salmon by other *Lepeophtheirus* lice species (Jones and Nemec, 2004).

Both of these genera have similar life histories and developmental stages (Kabata, 1972; Johnson and Albright, 1991a). The sea lice hatch from eggs and develop through two free-swimming naupilii stages before developing into an infectious free-swimming copepodid. At this point, the sea lice attach to their host and develop through four chalimus stages. The chalimus are “non-motile” and are attached to their host by a frontal filament. The final chalimus stage terminates as the sea lice become “motile” and are no longer attached to their hosts by the frontal filament. The sea lice can now move freely on the fish as they develop through a pre-adult stage before becoming reproductively viable adults.

Water temperature and salinity are two environmental variables that influence sea lice development, growth, survival and reproductive rate. In British Columbia, surface seawater temperatures range from approximately 6 °C to 13 °C. Research on sea lice abundance conducted in the Broughton Archipelago and elsewhere on the coast of British Columbia indicates that surface water temperature during the winter months does

not appear to hinder the seasonal abundance of *L. salmonis* (Saksida et al., 2007a, b). The rate of development and the generation times for *C. elongates* are strongly temperature dependent (Tully, 1992) and although this research has not been conducted, similar relationships with temperature are to be expected for *C. clemensi* (Jones and Johnson, 2015). Survival and development of *L. salmonis* is optimal in high salinity seawater. Under laboratory conditions copepodid survival was limited to conditions where salinity was greater than 10 ppt (Johnson and Albright, 1991b).

Marine Harvest Canada requested monitoring of sea lice abundance, prevalence and intensity on juvenile wild salmon within Quatsino Sound and Holberg Inlet in support of Aquaculture Stewardship Certification for their aquaculture sites within the area. This data summary report documents the observed sea lice infestation rates on retained juvenile salmonids collected in Quatsino Sound and Holberg Inlet in 2018. This represents the fourth year of wild juvenile salmonid monitoring in Quatsino Sound and Holberg Inlet conducted by Marine Harvest Canada. No Atlantic salmon have been captured or observed during sampling for juvenile salmonids at the 10 beach seine sites in Quatsino Sound completed in 2015, 2016, 2017 and 2018.

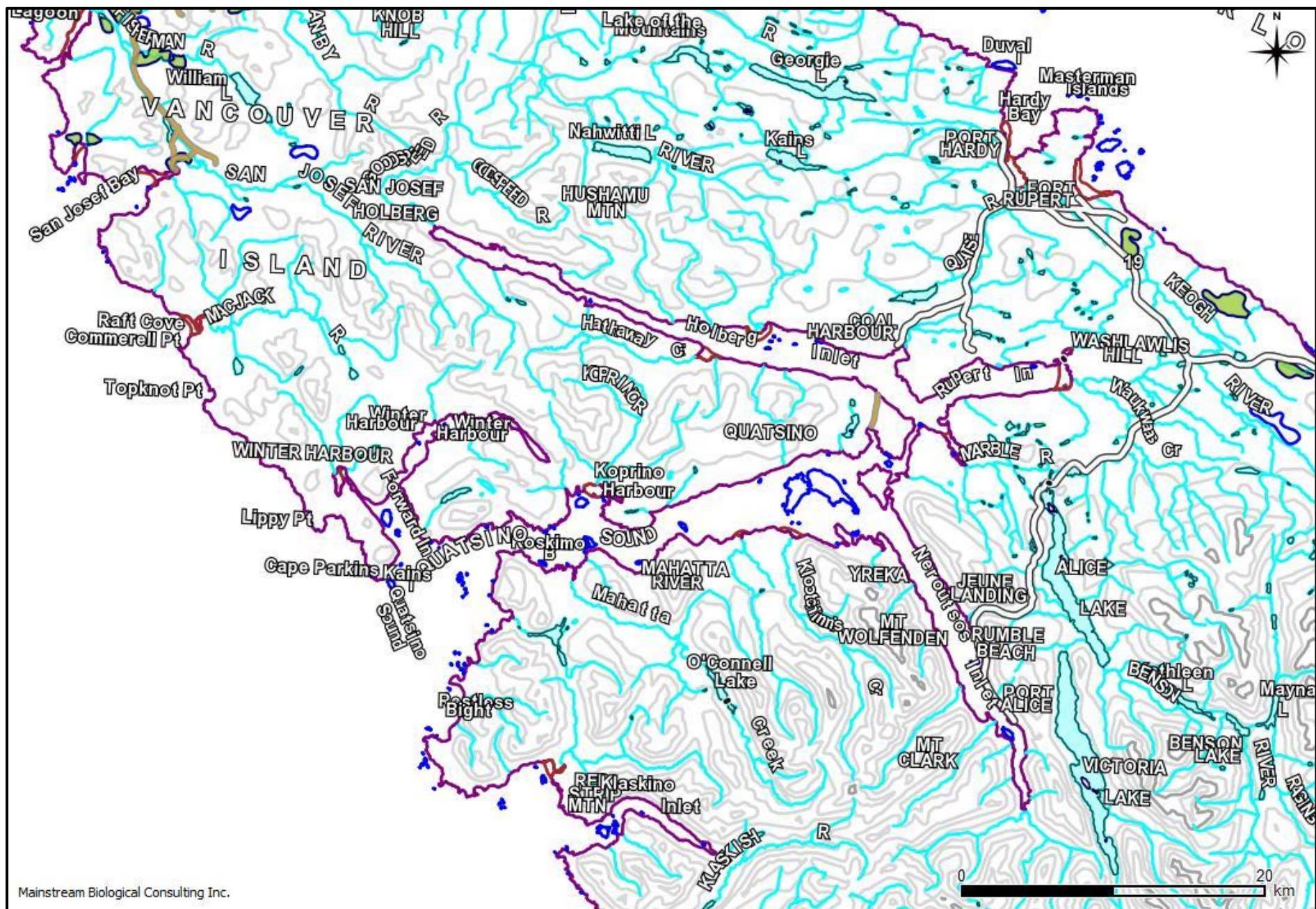


Figure 1: An overview map showing the location of Quatsino Sound and Holberg Inlet on the west coast of northern Vancouver Island, BC.

2.0 Methods

The fish inspected for sea lice infestation were collected from 10 sites in Quatsino Sound and Holberg Inlet, BC. These sites were chosen based on their locations relative to existing Marine Harvest Canada aquaculture sites in the area (Figure 2). The sites were sampled twice in 2018 on April 3 and May 1.

2.1 Site Locations

The 10 sites at which beach seining was conducted to collect specimens for sea lice analysis consisted of three sites in Holberg Inlet (Sites 1, 2 and 3) and seven sites in Quatsino Sound. The approximate locations of the 10 beach seine sites are shown in Figure 2. GPS coordinates collected in the field for the sites are presented in Table 1.

Table 1: The site number and location of the 10 beach seine sites where fish were collected for sea lice analysis in Quatsino Sound and Holberg Inlet in 2018.

Site #	UTM Coordinates (NAD 83)		
	UTM Zone	Easting	Northing
1	9	594113	5604358
2	9	598764	5603542
3	9	599381	5603384
4	9	586996	5592794
5	9	585851	5591387
6	9	581818	5591805
7	9	580210	5590249
8	9	578392	5590120
9	9	578608	5592552
10	9	579737	5594278

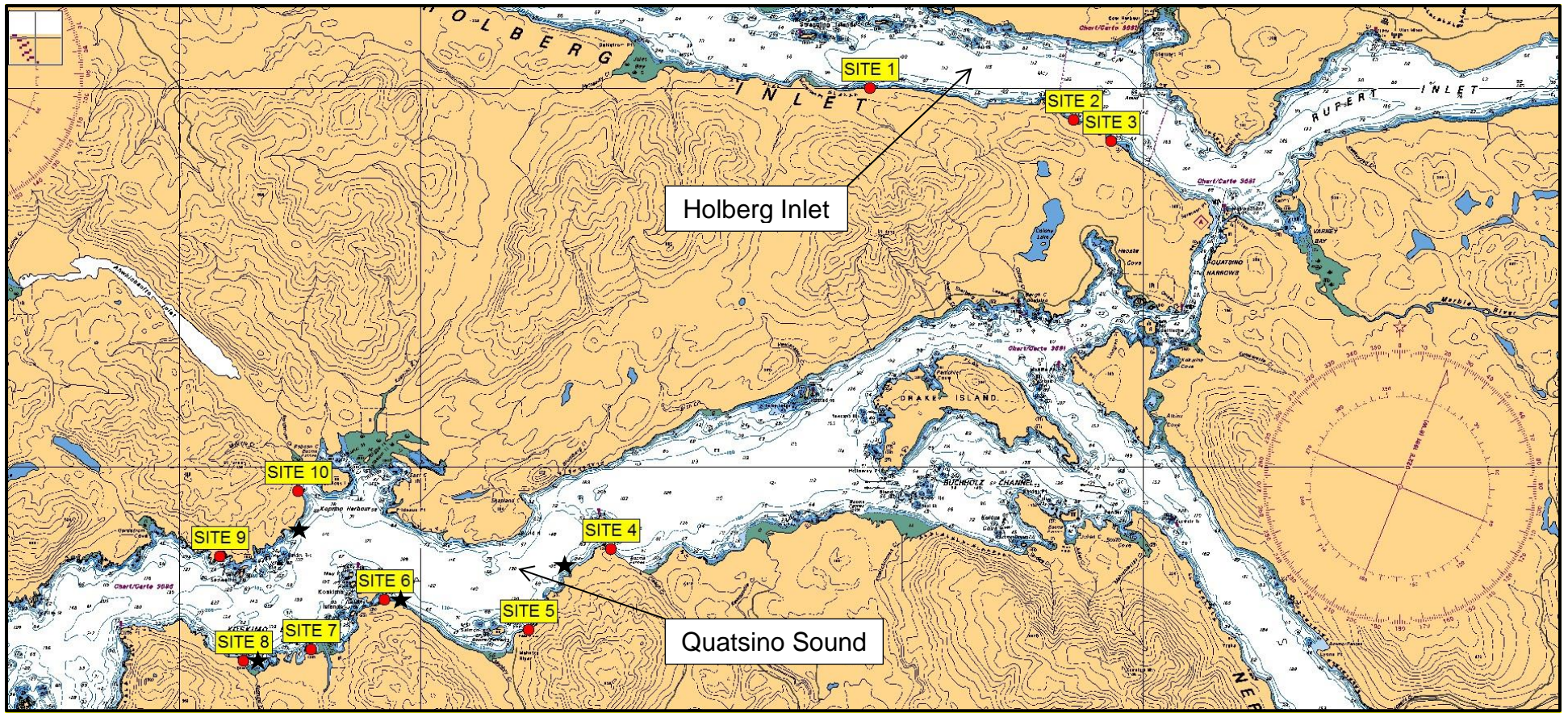


Figure 2: The locations of the 10 beach seine sites in Quatsino Sound and Holberg Inlet sampled in 2018. Marine Harvest Canada active aquaculture site locations are indicated with a black star.

2.2 Field Procedures

Procedures for beach seining, fish collection and field data recording adapted from procedures utilized by the Department of Fisheries and Oceans (DFO) were used for juvenile salmon sampling by Mainstream Biological Consulting staff during sampling in Quatsino Sound and Holberg Inlet in 2018.

An 18ft Boston Whaler, powered by a 60 horsepower outboard motor, was used to access the beach seine sites. A 150 ft (45.7 m) long by 12 ft (3.7 m) deep beach seine net was used to capture specimens. The net was constructed in three 50 ft (15.2 m) sections. The centre bunt section consists of one-quarter inch diameter diamond mesh, while the two side panels (wings) consist of half-inch diameter diamond mesh. Floats were located every 30 cm along the top-line and a lead line weighted the bottom of the net.

A four person crew was utilized to conduct the beach seine sets and retrieve samples in a consistent manner at each of the 10 selected sites. All beaches were approached slowly by boat and one crewmember was put ashore with the towline from one end of the beach seine net. The onshore crewmember held the towline at one side of the sample site, while the second and third crewmembers ensured the net deployed smoothly off the bow or side of the boat. The fourth crewmember, the boat operator, backed the boat in a wide semicircle towards the opposite side of the sample site and remained on the boat. When the net was fully deployed, the second and third crewmembers stepped into the shallow water with the towline or tossed it to the awaiting crewmember on shore. A slow retrieval of the net began immediately.

As the net was slowly retrieved, the probe of a water meter was placed just below the water surface at the stern end of the boat, to collect salinity and water temperature data. The meter was calibrated weekly with de-ionized water while traveling to the sample sites.

The crewmembers retrieved the net evenly from opposite ends ensuring that the lead line remained as close to the bottom as possible. All retrieved netting was piled on the beach above the water level. As the retrieval reached the net bunt, the lead line was retrieved at a faster rate than the floats to allow the netting of the bunt to form a bag under the captured fish. The lead line was then pulled up onto the beach above the

water level. One crewmember worked their way around the outside of the net in the shallow water to ensure the floats stayed above the surface of the water. In this manner a small, shallow bag formed from the bunt of the net held the captured fish in the water.

The three shore crew members participated in the collection of individual fish to ensure that captured fish remained in the net for as short a period of time as possible. The net was manipulated, if necessary, in response to rising or falling tides in order to ensure the captured fish remained in the net and were held in sufficient water to minimize stress. The level of sufficient water was dependant on the size and numbers of captured fish, but was generally thought of as enough water to minimize fish contact with the net or with other fish.

A total of 30 individuals from each target species captured or all of the individuals present (if less than 30) were collected as samples for sea lice infestation analysis. Individual fish were “swam” into an appropriately sized whirlpac bag. All handling of fish was kept to a minimum.

When all the fish for retention were collected, a total catch number for each species was recorded. The fish remaining in the net were counted out of the seine net, or an estimate of the remaining fish was made (estimates were used when it appeared that more than 500 individuals from any given species remained in the net). The total of fish remaining in the net was added to the number of retained individuals to calculate a total capture number for a given species.

A crewmember recorded all the information from each beach seine set in a standardized field form. The information recorded included the following:

- The site number (Site 1-10);
- The date;
- The time at the end of the individual fish collection;
- Comments on weather and oceanic conditions;
- Total capture and retained fish numbers for each specimen group; and
- Water temperature (°C) and salinity (ppt) to one decimal place.

The retained fish from each site were packaged separately in re-sealable bags and labelled with the site number (Site 1-10) and the week number (Week 1 or 2). Site

sample bags were placed in a portable freezer, which was plugged into the boat's battery. The specimens were transferred to a freezer immediately upon return from the field.

The beach seine net was reloaded onto the bow of the boat. Crewmembers scanned the net for obvious holes, which were repaired immediately if found. The YSI85 meter was shut off and stored, and all gear and coolers were reloaded into the boat.

The above procedures for beach seine net deployment and retrieval, as well as those described for fish collection, were repeated at all 10 sample sites.

2.3 Laboratory Procedures

Collected sample fish were frozen and delivered to the Center for Aquatic Health Sciences (CAHS) for laboratory analysis. Sea lice observed on the individual fish specimens during laboratory analysis were identified as either non-motile chalimus, or motile pre-adults and adults. Lice were identified as either of the two chalimus stages for *Lepeophtheirus salmonis* (Hamre et al., 2013) or four chalimus stages for *Caligus clemensi*. Motile lice, either pre-adults or adults, were identified as either *Lepeophtheirus salmonis* or *Caligus clemensi* and the sex of the louse was determined. Sea lice infestation data was tabulated by CAHS and provided to Mainstream Biological Consulting for reporting.

Data provided by CAHS also included measured fork length in millimetres and weight (recorded to the nearest tenth of a gram). Lengths and weights were recorded with the specimen's corresponding sea lice analysis results.

2.4 Data Analysis

Surface water quality data collected for temperature and salinity was summarized to report the minimum and maximum values as well as the calculated averages for each sample week.

Beach seine fish sample composition was summarized by species and site for each week. The recorded fork lengths and weights of the juvenile salmon sample population were summarized to present minimum and maximum values as well as calculated averages. Sea lice infestation rates, including the number of infested fish and the

number of sea lice identified, were determined for the juvenile salmon sample population. Prevalence, as defined as the number of host fish found to have one or more sea lice compared to the total number of host fish examined, was determined for chum salmon and coho salmon. Abundance, as defined as the total number of sea lice observed compared to the total number of host fish examined, was also determined for chum salmon and coho salmon. The intensity of sea lice infestation, as described by the number of sea lice found on a single salmon was summarized. Average intensity was calculated by dividing the total number of sea lice identified by the number of infested fish.

Statistical analysis of the spatial and temporal distribution of sea lice was not conducted. Spatial and temporal analysis has been limited to the simple presentation and discussion of the number of sea lice found on fish specimens collected from each site during each of the sampling events.

3.0 Results

The following sections outline the results of beach seine collection and subsequent sea lice inspection of juvenile salmonids collected from Quatsino Sound and Holberg Inlet, BC, in 2018. Water quality field data is presented in Appendix I, beach seine fish capture data is included in Appendix II and data on the juvenile salmon sample population including sea lice lab analysis results provided by CAHS are located in Appendix III.

3.1 Water Quality Parameters

Surface measurements of water temperature and salinity, taken during beach seining at each of the 10 sites during the two sample periods, are presented in Table 2. The field data recorded at each site is included in Appendix I.

Recorded surface water temperatures ranged from a low of 9.3 °C recorded at Site 9 on April 3, 2018, to a high of 14.2 °C recorded at Site 10 on May 1, 2018 (Table 2; Appendix I). Calculated weekly average surface water temperatures increased from 10.5 °C for April 3, 2018, to 11.4 °C for May 1, 2018.

Recorded surface water salinity ranged from a low of 17.0 ppt recorded at Site 7 on May 1, 2018, to a high of 32.4 ppt recorded at Site 6 and Site 8 on May 1, 2018 (Table 2; Appendix I). The calculated weekly average surface water salinity varied from 25.7 ppt for April 3, 2018 to 29.5 ppt for May 1, 2018.

Table 2: Water quality parameters collected at beach seine sites in Quatsino Sound and Holberg Inlet in 2018.

Site	April 3, 2018		May 1, 2018	
	Temp. (°C)	Salinity (ppt)	Temp. (°C)	Salinity (ppt)
1	11.8	23.0	10.0	30.4
2	11.8	23.1	10.0	30.1
3	10.0	21.0	11.8	27.9
4	11.6	25.7	10.4	32.0
5	9.8	28.5	9.9	30.4
6	11.3	25.9	11.3	32.4
7	10.1	27.5	12.6	17.0
8	9.5	28.4	11.7	32.4
9	9.3	26.4	12.1	32.3
10	9.6	27.1	14.2	29.7
Average	10.5	25.7	11.4	29.5

3.2 Fish Sample Composition

A total of 6781 fish were captured during beach seine sampling conducted in Quatsino Sound and Holberg Inlet, BC in 2018 with 399 retained for sea lice analysis (Table 3). A summary of the total number of fish captured and collected as specimens at each site over the collection period can be found in Table 4. Totals of fish captured and collected specimens at each site over the entire collection period can be found in Appendix II. Of the 6684 chum salmon captured, 325 individual chum salmon (4.9 %) were retained and underwent lab analysis. A total of 51 sockeye salmon were caught and 31 underwent lab analysis, 40 coho salmon were caught and 37 underwent lab analysis and all six chinook salmon captured underwent lab analysis (Table 3). No other species of Pacific salmon were captured, no threespine stickleback and no Atlantic salmon were captured during the two sampling events in April and May 2018 (Table 3).

Chum salmon smolts were captured in significantly greater numbers than any other species. A total of 6684 chum salmon were captured, representing 98.6 % of all captured salmonids (Table 3).

Table 3: The total of collected individuals of each fish species captured in Quatsino Sound and Holberg Inlet, BC in April and May 2018, and the percentage of the total capture population that they represent.

Common Name	Capture Totals (% of total capture population)	Collection Totals	Collection %
chum salmon	6684 (98.6 %)	325	4.9
coho salmon	40 (0.6 %)	37	92.5
sockeye salmon	51 (0.8 %)	31	60.8
chinook salmon	6 (0.09 %)	6	100.0
All species	6781	399	5.9

Table 4: The number of captured fish (Capture Total) and the number of individual fish collected (Sample Total) from each of the 10 sample sites in Quatsino Sound and Holberg Inlet, BC in April and May 2018.

SITE	Chum		Coho		Sockeye		Chinook		Capture Total	Sample Total
	Capture Total	Sample Total	Capture Total	Sample Total	Capture Total	Sample Total	Capture Total	Sample Total		
1	271	35	1	1	0	0	0	0	272	36
2	1226	56	4	4	0	0	4	4	1234	64
3	2809	40	32	29	0	0	2	2	2843	71
4	1	1	0	0	0	0	0	0	1	1
5	90	35	1	1	1	1	0	0	92	37
6	1103	35	2	2	50	30	0	0	1155	67
7	0	0	0	0	0	0	0	0	0	0
8	155	31	0	0	0	0	0	0	155	31
9	887	60	0	0	0	0	0	0	887	60
10	142	32	0	0	0	0	0	0	142	32
Total	6684	325	40	37	51	31	6	6	6781	399

3.3 Fish Sample Size Statistics

Summary statistics for the sample population of juvenile salmonids were completed for weight and fork length. This analysis was completed for chum, coho and sockeye salmon but not for chinook as the sample population was not of sufficient size to warrant this analysis.

3.3.1 Chum Salmon

Analysis of weight and fork length data was completed for the chum salmon sample population collected in Quatsino Sound and Holberg Inlet in 2018. The weight of 325 chum smolts collected during the two sample events ranged from 0.23 g to 10.02 g and averaged 0.85 g (SD = 1.0). The fork length of the chum smolts ranged from 30 mm to 97 mm and averaged 41 mm (SD = 8.4). Chum salmon weight and length data was summarized by month which shows an increase in both parameters in the sample population from April to May (Table 5).

3.3.2 Coho Salmon

Analysis of weight and fork length data was completed for the coho salmon sample population collected in Quatsino Sound and Holberg Inlet in 2018. All coho salmon were captured during the May 1, 2018 sampling event (Table 5). The weight of 37 coho smolts collected ranged from 4.3 g to 23.4 g and averaged 12.0 g (SD = 4.9). The fork length of the coho smolts ranged from 72 mm to 119 mm and averaged 96 mm (SD = 13.0).

3.3.3 Sockeye Salmon

Analysis of weight and fork length data was completed for the sockeye salmon sample population collected in Quatsino Sound and Holberg Inlet in 2018. The weight of 31 sockeye salmon collected during the two sample events ranged from 0.8 g to 6.1 g and averaged 4.6 g (SD = 1.0). The fork length of the sockeye ranged from 47 mm to 83 mm and averaged 74 mm (SD = 7.4). Only one sockeye was captured in April 2018 and the average length and weight for May are presented Table 5.

Table 5: Average weights and lengths summarized by month of chum, coho and sockeye salmon collected in Quatsino Sound and Holberg Inlet in 2018.

Species	Weight (g)		Length (mm)	
	April	May	April	May
Chum	0.50 (n=107)	1.0 (n=218)	37	43
Coho	-	12.0 (n=37)	-	96
Sockeye	0.8 (n=1)	4.8 (n=30)	47	75

3.4 Sea Lice Infestation Rates

The results of the laboratory analysis for the presence of sea lice on the sample population collected in Quatsino Sound and Holberg Inlet in 2018 are presented in Table 6. The data recorded for each fish in the sample population during lab analysis is included in Appendix III. A total of 399 samples were collected at 10 sites in Quatsino Sound and Holberg Inlet in 2018 and were inspected for sea lice infestation. A total of 33 individuals in the sample population were found to be infested with 74 sea lice (Table 6). A total of 18 chum smolts, 13 coho salmon and two sockeye salmon were found to be infested with sea lice (Table 6). This data reflects the identification of sea lice of either species (*L. salmonis* and *C. clemensi*) on inspected juvenile salmon. No sea lice were found on the six chinook salmon analyzed in the lab.

Prevalence was defined as the number of fish found to be infested with one or more sea louse compared to the total number of fish. Abundance was defined as the total number of sea lice observed compared to the total number of fish. The sea lice prevalence in the sample population collected in Quatsino Sound and Holberg Inlet in 2018 was 8.3 % and the abundance was 0.19 (Table 6). Sea lice counts of both species observed (*L. salmonis* and *C. clemensi*) were added together for the prevalence and abundance calculations for the entire sample population.

The intensity of sea lice infestation, as defined as the number of sea lice on a single sample, ranged from one louse found on 22 individuals to a maximum of 14 lice found on one individual. There were two samples infested with two lice, four infested by three lice, two infested with four lice, one found to have five lice, and one found to have nine lice. The average intensity was calculated by dividing the total number of sea lice by the number of infested fish which was 1.0 for chum salmon, 4.2 for coho salmon, 1.0 for sockeye salmon and 0 for chinook salmon (Table 6).

Table 6: Results of analysis for sea lice infestation on the sample population collected by beach seine in Quatsino Sound and Holberg Inlet, BC in 2018.

Species	Sample size (n)	Total number of lice observed	Total number of fish infested	Prevalence (%)	Abundance	Average Intensity
chum	325	18	18	5.5	0.06	1.0
coho	37	54	13	35.1	1.46	4.2
sockeye	31	2	2	6.5	0.06	1.0
chinook	6	0	0	0	0	0
Total	399	74	33	8.3	0.19	2.2

3.4.2 Infestation Rates on Chum Salmon

The results of the laboratory analysis for sea lice infestation for chum salmon are presented by site in Table 7. A total of 18 chum salmon were found to be infested with 18 sea lice. Sea lice counts of both sea lice species observed (*L. salmonis* and *C. clemensi*) were added together for the presentation of sea lice infestation, prevalence and abundance on the chum salmon sample population (Table 7).

The chum salmon sample population sea lice infestation rates were summarized by site. No chum were caught at Site 7 during sampling in 2018. No sea lice were found on chum salmon samples collected at Sites 1, 2, and 4 (Table 7).

A total of 18 chum salmon were found to be infested with at least one sea louse. The prevalence of sea lice on the chum salmon sample population (n=325) collected in Quatsino Sound and Holberg Inlet in 2018 was 5.5 %. Sea lice prevalence calculated by site and week for chum salmon is presented in Table 7. Sea lice prevalence was higher in chum salmon collected in May (6.9 %) than in April (2.8 %). The highest sea lice prevalence (12.9 %) was at Site 3 on May 1, 2018. Sea lice prevalence calculated by site for the total chum sample population was variable ranging from 0 at Sites 1, 2 and 4 to a high of 10.0 % at Site 3.

A total of 18 sea lice were identified during laboratory analysis of retained chum salmon. The abundance of sea lice on the chum salmon sample population (n=325) collected in Quatsino Sound and Holberg Inlet in 2018 was 0.06. Sea lice abundance was calculated by week and by site and is presented in Table 7. The highest sea lice abundance (0.13) was at Site 3 on May 1, 2018. Sea lice abundance calculated by site for the total chum sample population was also variable ranging from 0 at Site 1, 2, and 4 to a high of 0.10 at Site 3 and Site 8.

Table 7: The number of sea lice found on chum salmon collected in Quatsino Sound and Holberg Inlet in 2018 summarized by the 10 sites where beach seining was conducted. Calculated sea lice prevalence, abundance and average intensity is also included by site.

Site	Sample Week															Total Chum Sample Population		
	April 3, 2018							May 1, 2018										
	# of Chum Analyzed	# of Infested Chum	Average Weight of Infested Chum (g)	# of Lice	Prevalence (%)	Abundance	Average Intensity	# of Chum Analyzed	# of Infested Chum	Average Weight of Infested Chum (g)	# of Lice	Prevalence (%)	Abundance	Average Intensity	Prevalence (%)	Abundance	Average Intensity	
1	6	0	-	0	0	0	0	29	0	-	0	0	0	0	0	0	0	
2	26	0	-	0	0	0	0	30	0	-	0	0	0	0	0	0	0	
3	9	0	-	0	0	0	0	31	4	0.62	4	12.9	0.13	1.0	10.0	0.10	1.0	
4	1	0	-	0	0	0	0	0	-	-	-	-	-	-	0	0	0	
5	30	3	0.56	3	10.0	0.1	1.0	5	0	-	0	0	0	0	8.6	0.09	1.0	
6	3	0	-	0	0	0	0	32	3	2.32	3	9.4	0.09	1.0	8.5	0.09	1.0	
7	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	
8	0	-	-	-	-	-	-	31	3	1.14	3	9.7	0.10	1.0	9.7	0.10	1.0	
9	30	0	-	0	0	0	0	30	3	1.24	3	10.0	0.10	1.0	5.0	0.05	1.0	
10	2	0	-	0	0	0	0	30	2	0.98	2	6.7	0.07	1.0	6.3	0.06	1.0	
TOTAL	107	3	0.56	3	2.8	0.3	1.0	218	15	1.24	15	6.9	0.07	1.0	5.5	0.06	1.0	

3.4.3 Infestation Rates on Coho Salmon

The results of the laboratory analysis for sea lice infestation for coho salmon are presented by site in Table 8. There were no coho caught on April 3, 2018 therefore Table 8 represents data from the May 1, 2018 sampling event only. A total of 13 coho salmon were found to be infested with 54 sea lice in the coho salmon sample population (n=37). The sample population was collected at Sites 1, 2, 3, 5 and 6 as no coho salmon were captured at the remaining sites (Table 8).

Sea lice counts of both sea lice species observed (*L. salmonis* and *C. clemensi*) were added together for the presentation of sea lice infestation, prevalence and abundance on the coho salmon sample population (Table 8). Prevalence, abundance and average intensity in Table 8 also represent the coho sample population as a whole.

Sea lice were found on coho samples caught at Site 1 and Site 3 on May 1, 2018. A total of 13 coho salmon were found to be infested with at least one sea louse. The prevalence of sea lice on the coho salmon sample population (n=37) collected in Quatsino Sound and Holberg Inlet in 2018 was 35.1 %. Sea lice prevalence calculated by site and week for coho salmon and is presented in Table 8. The highest sea lice prevalence (100.0 %) was at Site 1 on May 1, 2018 but this was based on the analysis of one fish.

A total of 54 sea lice were identified during laboratory analysis of retained coho salmon. The abundance of sea lice on the coho salmon sample population (n=37) collected in Quatsino Sound and Holberg Inlet in 2018 was 1.46. Two coho were infested with one louse, two were infested with two lice, four coho were infested with three lice, two were infested with four lice, one coho was infested with five lice, one with nine lice and one coho salmon was infested with 14 lice. Sea lice abundance was calculated by week and by site and is presented in Table 8. The highest sea lice abundance (3.00) was at Site 1 on May 1, 2018 but this was based on the analysis of one fish.

Table 8: The number of sea lice found on coho salmon collected in Quatsino Sound and Holberg Inlet in 2018 summarized by the 10 sites where beach seining was conducted. Calculated sea lice prevalence, abundance and average intensity is also included by site.

Site	Sample Week						
	May 1, 2018						
	# of Coho Analyzed	# of Infested Coho	Average Weight of Infested Coho (g)	# of Lice	Prevalence ¹ (%)	Abundance ¹	Average Intensity ¹
1	1	1	5.4	3	100.0	3.0	3.0
2	4	0	-	0	0	0	0
3	29	12	12.6	51	41.4	1.76	4.3
4	0	-	-	-	-	-	-
5	1	0	-	0	0	0	0
6	2	0	-	0	0	0	0
7	0	-	-	-	-	-	-
8	0	-	-	-	-	-	-
9	0	-	-	-	-	-	-
10	0	-	-	-	-	-	-
TOTAL	37	13	12.0	54	35.1	1.46	4.2

¹ Prevalence, abundance and average intensity for May 1, 2018 also represent the total coho sample population

3.4.4 Infestation Rates on Sockeye Salmon

The sockeye sample population (n=31) collected in Quatsino Sound and Holberg Inlet in 2018 consisted of one fish collected at Site 5 on April 3, 2018 and 30 fish collected at Site 6 on May 1, 2018. Sea lice counts of both sea lice species observed (*L. salmonis* and *C. clemensi*) were added together for the presentation of sea lice infestation, prevalence and abundance on the sockeye salmon sample population.

Two sea lice were found on two sockeye salmon samples. The prevalence of sea lice on the sockeye salmon sample population (n=31) collected in Quatsino Sound and Holberg Inlet in 2018 was 6.5 %. The abundance of sea lice on the sockeye salmon sample population in 2018 was 0.06.

No sea lice were found on the one sockeye salmon collected at Site 5. Two lice were found on two separate sockeye salmon collected at Site 6 on May 1, 2018. The average weight of these infested fish was 4.0 g. The calculated sea lice prevalence for Site 6 was 6.7 % and the abundance was 0.7.

3.5 Infestation Rates by Sea Lice Species

A total of 10 *Lepeophtheirus salmonis* sea lice of various life stages were identified on 10 juvenile salmon and 64 *Caligus clemensi* sea lice were found on 23 of the samples analyzed in the lab (Appendix III). There were no juvenile salmon that were infested with both a *L. salmonis* and a *C. clemensi* sea louse.

3.5.1 Infestation Rates by Sea Lice Species on Chum Salmon

An analysis of the species of sea lice identified on the 18 infested chum salmon collected in Quatsino Sound and Holberg Inlet was completed and is presented in Table 9. A total of ten *Lepeophtheirus salmonis* sea lice of various life stages were identified on ten juvenile chum salmon and eight *Caligus clemensi* sea lice were found on eight of the juvenile chum salmon analyzed in the lab (Appendix III). None of the chum salmon analyzed in the lab were infested with multiple lice or lice from both species. The sea lice species identified on chum salmon are also presented by site in Table 10.

Table 9: The number of sea lice in each life stage by species identified on the chum salmon sample population from Quatsino Sound and Holberg Inlet in 2018. LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Life Stage ¹	April 3, 2018	May 1, 2018
LEP Co	2	1
LEP C1	0	2
LEP C2	0	5
LEP PAM	0	0
LEP PAF	0	0
LEP AM	0	0
LEP AF	0	0
TOTAL LEP	2	8
CAL Co	0	0
CAL C1	1	5
CAL C2	0	1
CAL C3	0	0
CAL C4	0	0
CAL PAM	0	1
CAL PAF	0	0
CAL AM	0	0
CAL AF	0	0
TOTAL CAL	1	7

¹ Lice life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female.

Table 10: The species of sea lice found on chum salmon collected in Quatsino Sound and Holberg Inlet in 2018 summarized by the 10 sites where beach seining was conducted. LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Site	Sample Week								TOTAL		
	April 3, 2018				May 1, 2018						
	# of Chum Analyzed	# of Infested Chum	# of LEP	# of CAL	# of Chum Analyzed	# of Infested Chum	# of LEP	# of CAL	# of Chum Analyzed	# of Infested Chum	# of Lice
1	6	0	0	0	29	0	0	0	35	0	0
2	26	0	0	0	30	0	0	0	56	0	0
3	9	0	0	0	31	4	0	4	40	4	4
4	1	0	0	0	0	-	-	-	1	0	0
5	30	3	2	1	5	0	0	0	35	3	3
6	3	0	0	0	32	3	3	0	35	3	3
7	0	-	-	-	0	-	-	-	0	-	-
8	0	-	-	-	31	3	1	2	31	3	3
9	30	0	0	0	30	3	3	0	60	3	3
10	2	0	0	0	30	2	1	1	32	2	2
TOTAL	107	3	2	1	218	15	8	7	325	18	18

3.5.2 Infestation Rates by Sea Lice Species on Coho Salmon

The sea lice species found on the 13 infested coho salmon are presented in Table 11. No coho salmon were captured during the April sampling event therefore Table 11 and Table 12 present data collected on retained coho salmon collected on May 1, 2018. No *Lepeophtheirus salmonis* sea lice were identified on any of the juvenile coho salmon analyzed in the lab (Appendix III). A total of 54 *Caligus clemensi* sea lice were found on 13 juvenile coho salmon analyzed in the lab (Appendix III). The locations where the individual fish were collected are presented in Table 12.

Table 11: The number of sea lice in each life stage by species identified on coho salmon from Quatsino Sound and Holberg Inlet in 2018. LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Life Stage ¹	May 1, 2018
LEP Co	0
LEP C1	0
LEP C2	0
LEP PAM	0
LEP PAF	0
LEP AM	0
LEP AF	0
TOTAL LEP	0
CAL Co	0
CAL C1	50
CAL C2	3
CAL C3	0
CAL C4	0
CAL PAM	0
CAL PAF	0
CAL AM	0
CAL AF	1
TOTAL CAL	54

¹ Lice life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female.

Table 12: The species of sea lice found on coho salmon collected in Quatsino Sound and Holberg Inlet in 2018 summarized by the 10 sites where beach seining was conducted. LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Site	Sample Week			
	May 1, 2018			
	# of Coho Analyzed	# of Infested Coho	# of LEP	# of CAL
1	1	1	0	1
2	4	0	0	0
3	29	12	0	53
4	0	-	-	-
5	1	0	0	0
6	2	0	0	0
7	0	-	-	-
8	0	-	-	-
9	0	-	-	-
10	0	-	-	-
TOTAL	37	13	0	54

3.5.3 Infestation Rates by Sea Lice Species on Sockeye Salmon

Two *Caligus clemensi* were identified on two sockeye salmon during lab analysis. The two sample fish were both collected at Site 6 on May 1, 2018. One sockeye was infested with one CAL C1 and one was infested with a CAL AM. No *Lepeophtheirus salmonis* were found on any of the sockeye salmon samples (n=31) analyzed in the lab.

4.0 Conclusions

This report presents the data from the fourth year of beach seining and sea lice analysis conducted for wild juvenile salmonid monitoring in Quatsino Sound and Holberg Inlet, BC by Marine Harvest Canada. This report is limited to the summary and presentation of the data collected in 2018. A tabular comparison of water quality data and chum sea lice infestation data from 2015, 2016, 2017 and 2018 is presented in Appendix IV.

A total of 399 samples underwent lab analysis for sea lice infestation in 2018 including 325 chum, 37 coho, 31 sockeye and six chinook salmon. Sea lice were found on the chum, coho and sockeye samples but no lice were found on the chinook samples. A total of 33 juvenile salmonids were found to be infested with sea lice in the total sample population, resulting in a calculated sea lice prevalence of 8.3 % in 2018. A total of 74 sea lice were found during laboratory analysis resulting in an abundance of 0.19 for the sample population.

Chum salmon smolts were captured in significantly greater numbers than any other species. A total of 6684 chum salmon were captured, representing 98.6 % of all captured samples. Of the 6684 chum captured, 325 were kept for lab analysis for sea lice infestation. A total of 18 chum smolts were found to be infested with a total of 18 lice resulting in a calculated prevalence of 5.5 %, abundance of 0.06 and an average intensity of 1.0 for the chum salmon sample population.

A total of 40 coho salmon were captured, representing 0.6 % of all captured samples. Of the 40 coho captured, 37 were kept for lab analysis for sea lice infestation. A total of 13 coho smolts were found to be infested with a total of 54 lice resulting in a calculated prevalence of 35.1 %, abundance of 1.46 and an average intensity of 4.2 for the coho salmon sample population. Two coho were infested with one louse, two were infested with two lice, four coho were infested with three lice, two were infested with four lice, one coho was infested with five lice, one with nine lice and one coho salmon was infested with 14 lice.

A total of 51 sockeye salmon were captured, representing 0.8 % of all captured samples. Of the 51 coho captured, 31 were kept for lab analysis for sea lice infestation. Two sea lice were found on two sockeye salmon smolts resulting in a calculated

prevalence of 6.5 %, abundance of 0.06 and an average intensity of 1.0 for the sockeye salmon sample population.

A total of 10 *Lepeophtheirus salmonis* sea lice of various life stages were identified on 10 juvenile salmon and 64 *Caligus clemensi* sea lice were found on 23 of the samples analyzed in the lab. There were no juvenile salmon that were infested with both a *L. salmonis* and a *C. clemensi* sea louse.

For the chum salmon sample population, a total of ten *Lepeophtheirus salmonis* sea lice of various life stages were identified on ten juvenile chum salmon and eight *Caligus clemensi* sea lice were found on eight of the juvenile chum salmon analyzed in the lab. None of the chum salmon analyzed in the lab were infested with multiple lice or lice from both species.

For the coho salmon sample population, 54 sea lice were identified on 13 juvenile coho salmon. All of the sea lice identified were *C. clemensi*, no *L. salmonis* sea lice were identified on any of the juvenile coho salmon analyzed in the lab. All of the coho salmon samples were collected in May 2018 and of the 54 sea lice identified on the samples, 53 of the lice were found on 12 samples collected at Site 3.

Two sea lice were found on two of the sockeye salmon sample population. Both of the lice were identified as *C. clemensi*.

A comparison of the prevalence, abundance and average intensity of sea lice species found on chum salmon was completed for sample data from 2015 and 2018 collected in Quatsino Sound and Holberg Inlet. This data is presented in the following summary table with additional yearly comparisons of juvenile wild salmon monitoring results presented in Appendix IV.

Year	<i>Caligus clemensi</i>			<i>Lepeophtheirus salmonis</i>		
	Prevalence	Abundance	Average Intensity	Prevalence	Abundance	Average Intensity
2015	13.6 %	0.24	1.75	12.4 %	0.21	1.72
2016	8.6 %	0.11	1.32	8.9 %	0.10	1.09
2017	1.7 %	0.02	1.00	1.7 %	0.02	1.00
2018	2.5 %	0.02	1.00	3.1 %	0.03	1.00

5.0 References

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Appendix I – Field Data

Date	Time	Site	Salinity (ppt) 0.2m	Temperature (° C) 0.2m
04/03/18	7:50	Site 1	23.0	11.8
04/03/18	8:10	Site 2	23.1	11.8
04/03/18	8:30	Site 3	21.0	10.0
04/03/18	9:15	Site 4	25.7	11.6
04/03/18	9:40	Site 5	28.5	9.8
04/03/18	10:00	Site 6	25.9	11.3
04/03/18	10:18	Site 7	27.5	10.1
04/03/18	10:30	Site 8	28.4	9.5
04/03/18	10:50	Site 9	26.4	9.3
04/03/18	11:10	Site 10	27.1	9.6
05/01/18	8:05	Site 1	30.4	10.0
05/01/18	8:30	Site 2	30.1	10.0
05/01/18	8:58	Site 3	27.9	11.8
05/01/18	9:48	Site 4	32.0	10.4
05/01/18	10:16	Site 5	30.4	9.9
05/01/18	10:54	Site 6	32.4	11.3
05/01/18	11:12	Site 7	17.0	12.6
05/01/18	11:34	Site 8	32.4	11.7
05/01/18	11:56	Site 9	32.3	12.1
05/01/18	12:21	Site 10	29.7	14.2

Appendix II – Capture and Collection Sample Totals

Date	Time	Site Name	Weather Comments	Tide Stage	Chum Captured	Chum Retained	Coho Captured	Coho Retained	Chinook Captured	Chinook Retained	Sockeye Captured	Sockeye Retained	Salmonid Mortalities	Comments
04/03/18	7:50	Site 1	Calm, light rain	Mid	6	6	0	0	0	0	0	0	0	1 sculpin, 1 sand dab
04/03/18	8:10	Site 2	Calm, showers	Mid	26	26	0	0	0	0	0	0	0	6 pipefish, 4 sculpins
04/03/18	8:30	Site 3	Calm, heavy rain	Low	9	9	0	0	2	2	0	0	0	7 tubesnouts, 10 sculpins, 2 gunnels, 1 cutthroat trout - 27cm
04/03/18	9:15	Site 4	Calm, rain	Low	1	1	0	0	0	0	0	0	0	3 perch, 1 gunnel, 1 tubesnout
04/03/18	9:40	Site 5	Small chop, heavy rain	Low	85	30	0	0	0	0	1	1	0	20 surf perch, abundance of kelp
04/03/18	10:00	Site 6	Slight chop	Low	3	3	0	0	0	0	0	0	0	22 surf perch, abundance of kelp
04/03/18	10:18	Site 7	Calm	Low	0	0	0	0	0	0	0	0	0	5 flounder, 1 tubesnout
04/03/18	10:30	Site 8	Calm	Low	0	0	0	0	0	0	0	0	0	8 flounders, good habitat
04/03/18	10:50	Site 9	Calm, rain	Low	67	30	0	0	0	0	0	0	0	12 flounder, 12 tubesnout, 8 sculpin
04/03/18	11:10	Site 10	Calm, rain	Low	2	2	0	0	0	0	0	0	0	1 juvenile rockfish, 10 tubesnouts
05/01/18	8:05	Site 1	Calm, clear	Low	265	29	1	1	0	0	0	0	0	2 gunnels, 1 shiner perch, 2 sculpins
05/01/18	8:30	Site 2	Slight chop	Low	1200	30	4	4	4	4	0	0	0	5 pipefish, 1 starry flounder, 3 shiner perch
05/01/18	8:58	Site 3	Calm, clear	Low	2800	31	32	29	0	0	0	0	5	Bycatch released to save stress on salmon
05/01/18	9:48	Site 4	Calm, clear	Low	0	0	0	0	0	0	0	0	6	Various bycatch released due to abundance of kelp in net
05/01/18	10:16	Site 5	Slight breeze	Low	5	5	1	1	0	0	0	0	0	1 shiner perch, 26 surf perch, 1 lingcod, 2 juvenile rockfish,
05/01/18	10:54	Site 6	Calm, clear	Low	1100	32	2	2	0	0	50	30	0	Set in bay around corner
05/01/18	11:12	Site 7	Calm, clear	Low	0	0	0	0	0	0	0	0	0	3 sculpin, 1 gunnel, 4 flounder, 6 pipefish, Several flounder and pipefish released
05/01/18	11:34	Site 8	Calm, clear	Low	155	31	0	0	0	0	0	0	0	1 gunnel, 1 lingcod, 3 sculpins
05/01/18	11:56	Site 9	Calm, clear	Low	820	30	0	0	0	0	0	0	0	2 sculpins released
05/01/18	12:21	Site 10	Calm, clear	Low	141	30	0	0	0	0	0	0	4	

Appendix III – Sea Lice Analysis Data

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
3-Apr-18	Site 1	CM	35	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 1	CM	37	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 1	CM	35	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 1	CM	38	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 1	CM	34	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 1	CM	30	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	33	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	42	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	31	0.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	38	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	39	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	36	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	36	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	36	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	34	0.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	39	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	36	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	38	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	33	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	36	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	39	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	35	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	39	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	38	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	34	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	37	0.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 2	CM	39	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CH	71	3.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CH	48	1.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	35	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	38	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	38	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	38	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	38	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	39	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	41	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
3-Apr-18	Site 3	CM	37	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 3	CM	39	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 4	CM	38	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	40	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	43	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	42	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	37	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	34	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	40	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	36	0.51	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.54	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
3-Apr-18	Site 5	CM	38	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	37	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	36	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	42	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	34	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	37	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	33	0.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	40	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	35	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	38	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	38	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	35	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	37	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	43	0.64	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	37	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	39	0.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	CM	38	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 5	SK	47	0.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 6	CM	46	1.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 6	CM	38	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 6	CM	45	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	40	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	42	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	39	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	37	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
3-Apr-18	Site 9	CM	38	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	32	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	39	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	35	0.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	37	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	35	0.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	37	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	37	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	40	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	38	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 9	CM	36	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 10	CM	36	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-18	Site 10	CM	35	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	36	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	42	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	31	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	35	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	39	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	40	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	32	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	40	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	39	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	40	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	36	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	35	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	42	0.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	38	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	35	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	40	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	39	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 1	CM	40	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	45	1.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	39	0.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	34	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	35	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	36	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	35	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	38	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	38	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	38	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	36	0.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CM	36	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 1	CO	78	5.43	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
1-May-18	Site 2	CH	37	0.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CH	42	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CH	43	0.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CH	44	1.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	37	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	40	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	37	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	36	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	35	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	36	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	36	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	35	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	37	0.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	36	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	36	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	37	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	39	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	40	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	44	0.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	40	0.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	35	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	37	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	40	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 2	CM	38	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	38	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	48	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CM	97	10.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CO	119	23.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CO	111	17.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CO	88	8.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 2	CO	117	19.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	37	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	35	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	42	0.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	37	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	35	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	38	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	36	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	34	0.49	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 3	CM	37	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	37	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	38	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	42	0.89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	39	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	35	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	35	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	36	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	38	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	40	0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	34	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	37	0.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	42	0.63	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 3	CM	37	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	37	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	45	1.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	36	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	38	0.6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 3	CM	36	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	36	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	32	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CM	39	0.75	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 3	CM	94	9.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	92	13.68	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
1-May-18	Site 3	CO	115	21.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	78	6.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	85	6.59	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 3	CO	94	10.58	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
1-May-18	Site 3	CO	113	16.64	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 3	CO	104	12.82	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
1-May-18	Site 3	CO	110	16.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	108	15.04	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5
1-May-18	Site 3	CO	95	13.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	102	12.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	113	17.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	92	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	78	6.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	87	8.89	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
1-May-18	Site 3	CO	74	5.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	105	14.98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	99	16.48	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9
1-May-18	Site 3	CO	107	16.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1-May-18	Site 3	CO	90	9.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	95	9.98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	96	12.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	90	9.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	81	6.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	103	13.31	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	14
1-May-18	Site 3	CO	108	16.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	91	9.36	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
1-May-18	Site 3	CO	97	11.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 3	CO	88	10.79	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	3
1-May-18	Site 5	CM	38	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 5	CM	40	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 5	CM	43	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 5	CM	41	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 5	CM	75	4.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 5	CO	90	6.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	65	2.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	58	2.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	64	2.58	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	38	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	47	1.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	70	5.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	56	2.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	63	3.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	38	0.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	43	1.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	55	1.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	38	0.82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 6	CM	68	3.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	38	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	40	0.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	75	5.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	58	2.2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	50	1.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	54	1.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	36	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	44	1.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	58	2.18	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	51	1.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	43	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	51	1.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	82	6.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	53	1.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	38	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	53	1.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	33	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	43	0.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CM	34	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CO	72	4.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	CO	78	5.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	82	5.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	82	5.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	81	5.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	72	5.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	68	3.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
1-May-18	Site 6	SK	65	4.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	67	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	71	4.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	73	3.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	76	4.02	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 6	SK	79	4.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	76	5.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	78	4.97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	83	5.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	75	5.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	77	4.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	73	3.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	72	5.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	71	3.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	82	4.98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	83	6.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 6	SK	80	5.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	82	5.84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	78	5.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	73	4.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	65	4.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	70	4.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	78	5.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	72	3.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 6	SK	69	3.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	43	0.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	44	1.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	55	1.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	58	2.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	43	0.92	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	43	0.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	47	1.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	39	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	47	1.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	45	1.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	45	1.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	47	1.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	48	1.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	51	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
1-May-18	Site 8	CM	53	1.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	36	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	52	1.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	53	1.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	49	1.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	47	1.16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1-May-18	Site 8	CM	41	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	52	1.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	41	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	47	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	45	1.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	41	0.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	51	1.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	51	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	53	1.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	63	2.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 8	CM	54	1.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	40	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	38	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	47	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 9	CM	38	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	39	0.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	37	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	36	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	39	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	43	0.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	45	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	50	1.2	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	45	1.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	41	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	45	1.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	48	1.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	45	0.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	40	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	50	1.45	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	42	0.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	42	0.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	40	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	48	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	45	1.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	48	1.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	40	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	38	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	42	0.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	50	1.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	48	1.08	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 9	CM	38	0.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	45	1.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	50	1.39	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	42	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	41	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	38	0.57	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1-May-18	Site 10	CM	35	0.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	36	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	37	0.51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	44	0.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	35	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	42	0.82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	38	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample Date	Site	Fish Species	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal C2	Cal C3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
1-May-18	Site 10	CM	39	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	38	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	38	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	45	0.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	43	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	38	0.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	35	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	39	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	37	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	42	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	42	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-May-18	Site 10	CM	40	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix IV – 2015-2018 Comparisons

Surface water temperature comparison between data collected in Quatsino Sound and Holberg Inlet between 2015 and 2018.

Site	April Temp. (°C)				May Temp. (°C)			
	2015	2016	2017	2018	2015	2016	2017	2018
1	8.7	11.1	9.2	11.8	11.6	10.8	12.3	10.0
2	8.0	11.2	8.5	11.8	11.9	11.1	12.5	10.0
3	8.4	11.0	8.5	10.0	12.5	11.2	12.4	11.8
4	9.7	9.8	8.9	11.6	11.6	11.0	12.5	10.4
5	9.6	10.0	9.1	9.8	11.2	11.2	13.1	9.9
6	10.5	9.9	9.1	11.3	12.1	11.6	12.8	11.3
7	10.1	9.9	9.0	10.1	12.3	11.0	12.9	12.6
8	10.0	9.6	9.0	9.5	12.7	11.1	12.5	11.7
9	10.0	9.3	9.0	9.3	11.9	11.2	12.9	12.1
10	10.4	8.1	8.5	9.6	13.5	11.1	12.7	14.2
Average	9.5	10.0	8.8	10.5	12.1	11.1	12.7	11.4

Surface water salinity comparison between data collected in Quatsino Sound and Holberg Inlet between 2015 and 2018.

Site	April Salinity (ppt)				May Salinity (ppt)			
	2015	2016	2017	2018	2015	2016	2017	2018
1	14.0	22.3	21.9	23.0	27.5	27.9	22.1	30.4
2	13.8	21.0	23.7	23.1	28.4	27.8	21.7	30.1
3	18.1	21.0	22.3	21.0	28.0	27.7	21.1	27.9
4	26.2	26.6	28.8	25.7	30.2	29.5	25.5	32.0
5	26.5	27.7	29.0	28.5	29.8	29.3	24.5	30.4
6	27.2	27.8	28.6	25.9	30.3	29.6	25.2	32.4
7	24.3	27.5	28.4	27.5	29.9	29.0	24.9	17.0
8	20.2	24.2	28.3	28.4	30.4	29.4	23.8	32.4
9	26.5	13.8	28.1	26.4	30.4	29.5	24.4	32.3
10	26.3	9.2	21.0	27.1	29.8	25.5	20.1	29.7
Average	22.3	22.1	26.0	25.7	29.5	28.5	23.3	29.5

A comparison of the results of analysis for sea lice infestation on samples collected by beach seine in Quatsino Sound and Holberg Inlet, BC between 2015 and 2018.

Species	Sample size (n) 2015	Sample size (n) 2016	Sample size (n) 2017	Sample size (n) 2018	Total # of fish infested 2015	Total # of fish infested 2016	Total # of fish infested 2017	Total # of fish infested 2018	Prevalence (%) 2015	Prevalence (%) 2016	Prevalence (%) 2017	Prevalence (%) 2018
chum	177	235	479	325	37	36	16	18	20.9	15.3	3.3	5.5
coho	21	1	58	37	7	0	6	13	33.3	0.0	10.3	35.1
pink	1	2	0	0	0	1	0	0	0.0	50.0	-	-
chinook	12	19	0	6	2	9	0	0	16.7	47.4	-	0
sockeye	0	0	0	31	0	0	0	2	-	-	-	6.5
TSB	7	0	1	0	4	0	1	0	57.1	-	100	-
Total	218	257	538	399	50	46	23	33	22.9	17.9	4.3	8.3

Species	Sample size (n) 2015	Sample size (n) 2016	Sample size (n) 2017	Sample size (n) 2018	Total # of lice observed 2015	Total # of lice observed 2016	Total # of lice observed 2017	Total # of lice observed 2018	Abundance 2015	Abundance 2016	Abundance 2017	Abundance 2018
chum	177	235	479	325	80	54	16	18	0.45	0.23	0.03	0.06
coho	21	1	58	37	12	0	11	54	0.57	0.00	0.19	1.46
pink	1	2	0	0	0	1	0	-	0.0	0.50	-	-
chinook	12	19	0	6	2	14	0	0	0.17	0.74	-	0
sockeye	0	0	0	31	0	0	0	2	-	-	-	0.06
TSB	7	0	1	0	5	0	2	-	0.71	-	2.0	-
Total	218	257	538	399	99	69	29		0.45	0.27	0.05	0.19

A comparison of the calculated sea lice prevalence and abundance by site and by week as determined for chum salmon collected in Quatsino Sound and Holberg Inlet, BC between 2015 and 2018.

Site	Sample Month															
	April								May							
	Prevalence (%) 2015	Prevalence (%) 2016	Prevalence (%) 2017	Prevalence (%) 2018	Abundance 2015	Abundance 2016	Abundance 2017	Abundance 2018	Prevalence (%) 2015	Prevalence (%) 2016	Prevalence (%) 2017	Prevalence (%) 2018	Abundance 2015	Abundance 2016	Abundance 2017	Abundance 2018
1	6.6	0	0	0	0.07	0	0	0	31.3	20.0	0	0	0.50	0.33	0	0
2	0	3.3	3.3	0	0	0.03	0.3	0	0	33.3	3.3	0	0	0.03	0.03	0
3	3.3	0	0	0	0.03	0	0	0	17.2	-	0	12.9	0.17	-	0	0.13
4	40.0	-	3.3	0	0.80	-	0.03	0	-	-	3.3	-	-	-	0.03	-
5	-	0	0	10.0	-	0	0	0.1	-	-	3.3	0	-	-	0.03	0
6	-	-	0	0	-	-	0	0	-	-	0	9.4	-	-	0	0.09
7	0	26.7	0	-	0	0.40	0	-	-	-	3.2	-	-	-	0.03	-
8	41.9	-	0	-	1.10	-	0	-	50.0	-	23.3	9.7	2.50	-	0.23	0.10
9	-	10.0	3.3	0	-	0.17	0.03	0	60.0	65.5	0	10.0	2.60	1.00	0	0.10
10	-	3.3	0	0	-	0.03	0	0	-	-	6.7	6.7	-	-	0.07	0.07
TOTAL	17.1	6.9	1.5	2.8	0.39	0.10	0.01	0.3	26.4	48.9	4.7	6.9	0.54	0.74	0.05	0.07

The number of sea lice in each life stage by species identified on the chum salmon sample population from Quatsino Sound and Holberg Inlet in 2015, 2016, 2017 and 2018.

LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Life Stage ¹	Number of Lice 2015	Number of Lice 2016	Number of Lice 2017	Number of Lice 2018
LEP Co	2	3	6	3
LEP C1	12	6	2	2
LEP C2	21	9	0	5
LEP PAM	0	6	0	0
LEP PAF	2	0	0	0
LEP AM	1	1	0	0
LEP AF	0	0	0	0
TOTAL LEP	38	25	8	10
CAL Co	2	3	1	0
CAL C1	24	18	6	6
CAL C2	7	4	1	1
CAL C3	4	2	0	0
CAL C4	5	2	0	0
CAL PAM	0	0	0	1
CAL PAF	0	0	0	0
CAL AM	0	0	0	0
CAL AF	0	0	0	0
TOTAL CAL	42	29	8	8

¹ Lice life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female.

The species of sea lice found on chum salmon collected in Quatsino Sound and Holberg Inlet between 2015 and 2018 summarized by the 10 sites where beach seining was conducted. LEP = *Lepeophtheirus salmonis* CAL = *Caligus clemensi*

Site	April							
	# of LEP 2015	# of LEP 2016	# of LEP 2017	# of LEP 2018	# of CAL 2015	# of CAL 2016	# of CAL 2017	# of CAL 2018
1	0	0	0	0	2	0	0	0
2	0	1	1	0	0	0	0	0
3	1	0	0	0	0	0	0	0
4	2	-	1	0	2	-	0	0
5	-	0	0	2	-	0	0	1
6	-	-	0	0	-	-	0	0
7	0	2	0	-	0	10	0	-
8	23	-	0	-	11	-	0	-
9	-	2	0	0	-	3	1	0
10	-	1	0	0	-	0	0	0
TOTAL	26	6	2	2	15	13	1	1

Site	May							
	# of LEP 2015	# of LEP 2016	# of LEP 2017	# of LEP 2018	# of CAL 2015	# of CAL 2016	# of CAL 2017	# of CAL 2018
1	1	3	0	0	15	2	0	0
2	0	0	1	0	0	1	0	0
3	3	-	0	0	2	-	0	4
4	-	-	1	-	-	-	0	-
5	-	-	1	0	-	-	0	0
6	-	-	0	3	-	-	0	0
7	-	-	1	-	-	-	0	-
8	2	-	1	1	3	-	6	2
9	6	16	0	3	7	13	0	0
10	-	-	1	1	-	-	1	1
TOTAL	12	19	6	8	27	16	7	7

A comparison of sea lice infestation rates on chum salmon collected in Quatsino Sound and Holberg Inlet between 2015 and 2018.

Year	<i>Caligus clemensi</i>			<i>Lepeophtheirus salmonis</i>		
	Prevalence	Abundance	Average Intensity	Prevalence	Abundance	Average Intensity
2015	13.6 %	0.24	1.75	12.4 %	0.21	1.72
2016	8.6 %	0.11	1.32	8.9 %	0.10	1.09
2017	1.7 %	0.02	1.0	1.7 %	0.02	1.00
2018	2.5 %	0.02	1.00	3.1 %	0.03	1.00